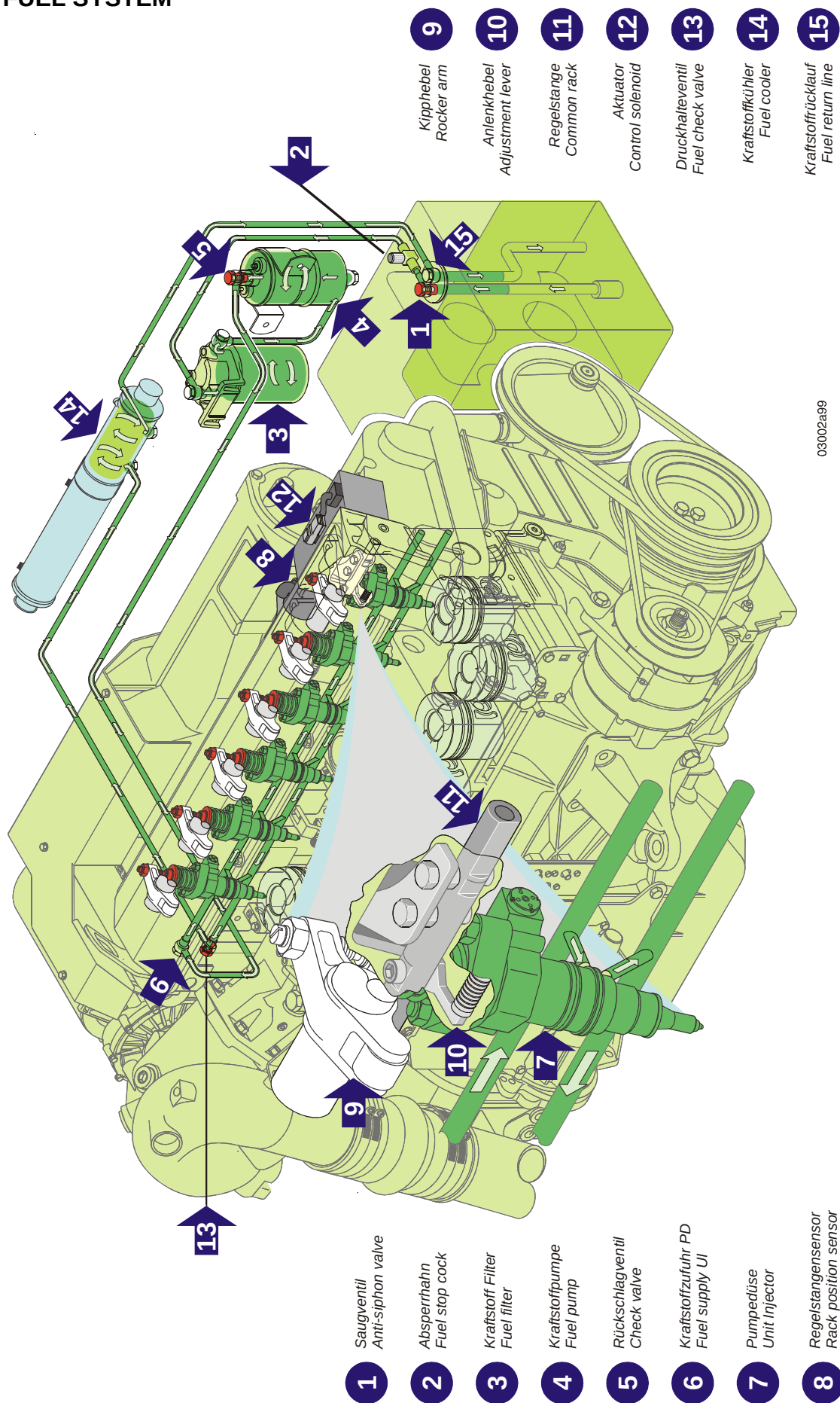


03 FUEL SYSTEM**Table of Contents**

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03.00 FUEL SYSTEM



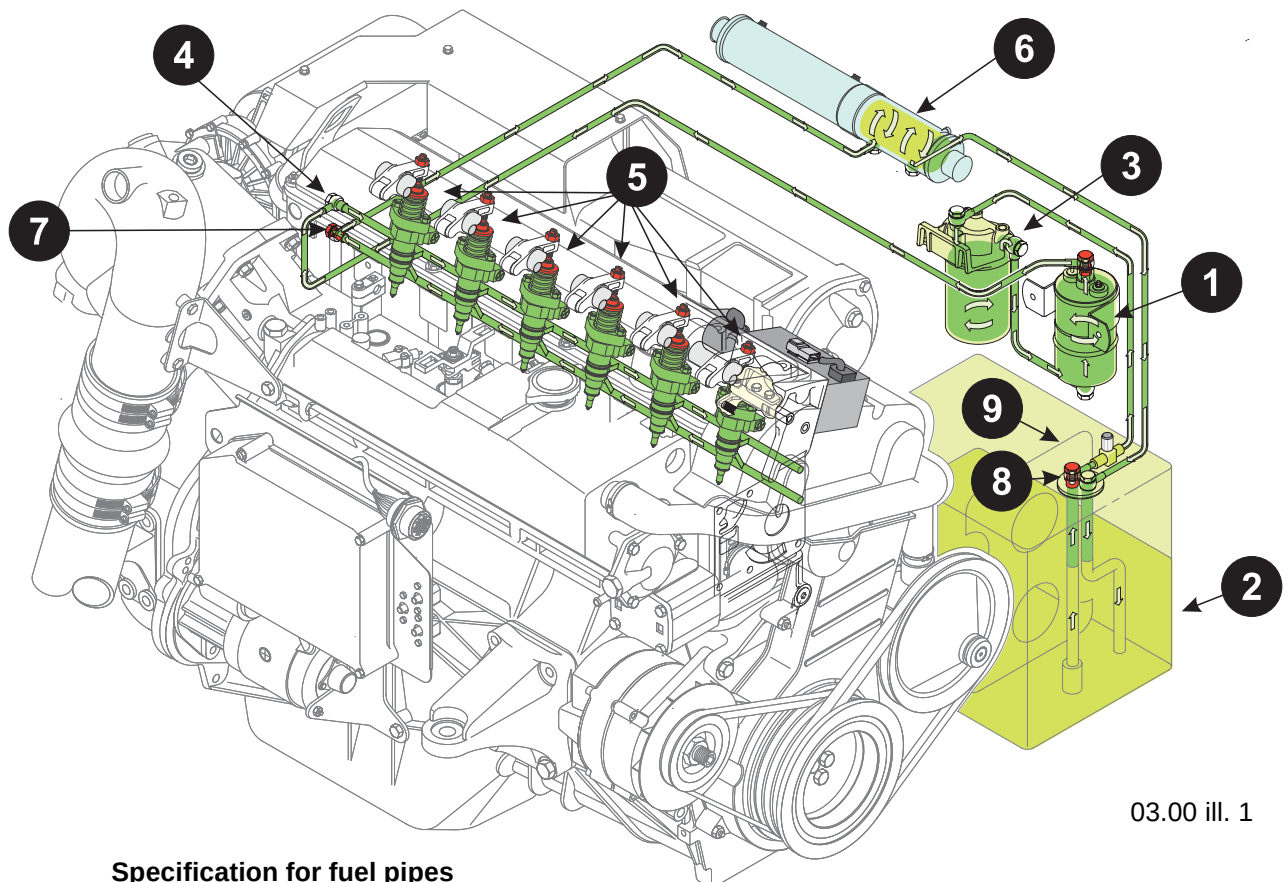
03002a99

Functional Description

When the ignition switch is turned, an electric fuel pump **1** is put into operation and sucks fuel from the fuel tank **2**. This fuel is led via fuel filter **3** to the fuel pump. From the fuel pump, fuel is pumped to the engine block **4** and the unit injectors **5**. Excess fuel not injected by the unit injectors is led via fuel cooler **6** back to the fuel tank.

The operating pressure is controlled by pressure valve **7** (1,8 - 2,5 bar at idle).
8 anti-siphon valve; **9** baffles (depending on tank size)

For fuel requirements, refer to chapter GENERAL



03.00 ill. 1

Specification for fuel pipes

Minimum inside diameter: **8 mm**
 Recommended material: stainless steel or copper
NOTE: Min. inside diameter for hosepipes or PA-pipes is **10 mm**.

Rate of flow: **> 240l/h +/-7** (in case of continuously operating pump)
 If additional filters are installed, the requirements of higher flow rates must be considered. (filter dimension)

NOTE: In case of pipe connections, pay special attention to the tightness of the suction pipe (all fittings and line before fuel pump)!

Types of pipe connections



03.00 ill. 2

03.02 FUEL PUMP, UNIT INJECTOR, LINES

03.02.01 Replace fuel pump

Fuel pump operation is controlled by EMS.

Disassembly

- 1 ● Ventilate drain fuel system. For this purpose, open fuel line between fuel filter and fuel pump (**ill.4/pos.1**) and let pump run for approx. 6 x 10 sec. Make sure that air is sucked into the line.

ATTENTION: Close fuel cock on tank, if tank is higher.

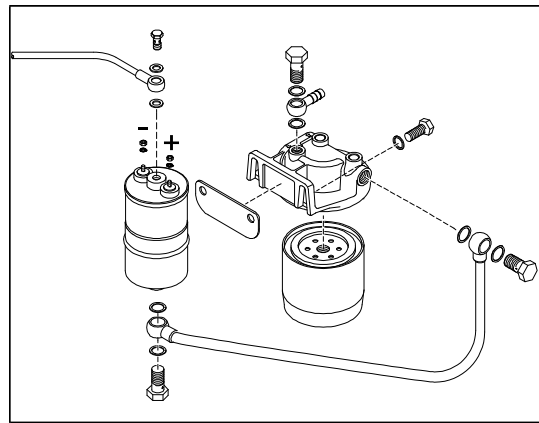


- 2 **ATTENTION:** Prior to disassembly, disconnect battery cables from battery, to avoid damages to the electronic system.



- 3 Disconnect positive cable and negative cable (**ill.6**) by unscrewing hexagon nuts (SW7/8) with washer from terminals of fuel pump.
- 4 Unscrew hollow screw (**ill.6/pos.1**) of fuel feed line. Dispose Cu-sealing rings.
- 5 Unscrew hollow screw (**ill.6/pos.2**) of fuel line. Dispose Cu-sealing rings.

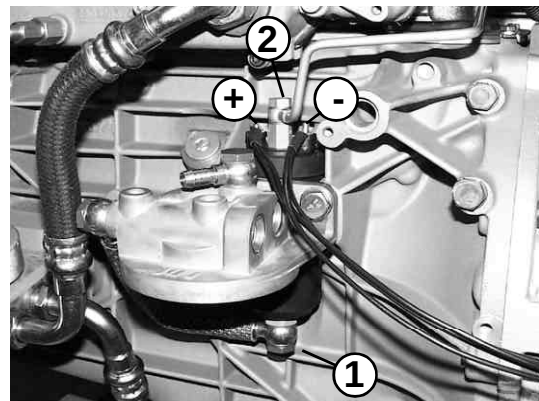
ATTENTION: Hold up with second wrench on hexagon of pump housing, to avoid a damage to the E-pump.



02.01 ill.3



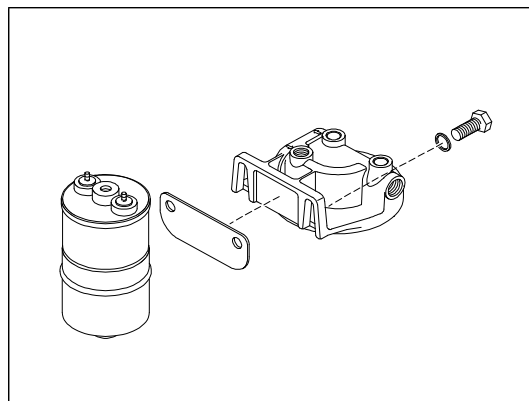
02.01 ill.4



02.01 ill.6

6 **For 4 cyl. engines only**

Unscrew two hexagon screws of filter plate.
Remove filter plate and holding strap.
Remove fuel pump.



02.01 ill.7

For 6 cyl. engines only (item 7-8)

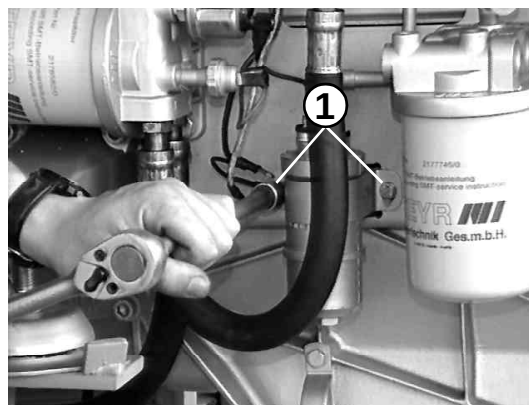
- 7** Remove two hexagon screws (SW10) for fixing fuel pump on filter plate (ill.8/pos.1), as well as ground wire.

ATTENTION: Mark position of fuel pump on pump support.



- 8** Remove pump bracket.

ATTENTION: Measure height for assembly of pump because of fitting position of fuel lines.

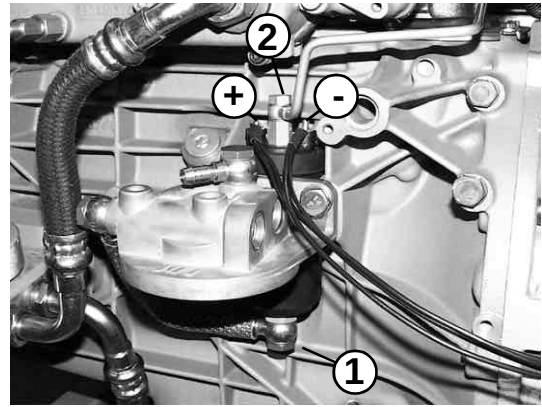


02.01 ill.8

Assembly

● For 4 cyl. engines only (item 1-3)

- 1 Place new fuel pump.
- 2 Mount filter bracket with holding strap by means of 2 hexagon screws.
- 3 Attach fuel line between filter and pump (ill.9/pos.1) as well as pump and block (ill.9/pos.2). Tighten hollow screws with a torque of **30 Nm +/-3**.



02.01 ill.9

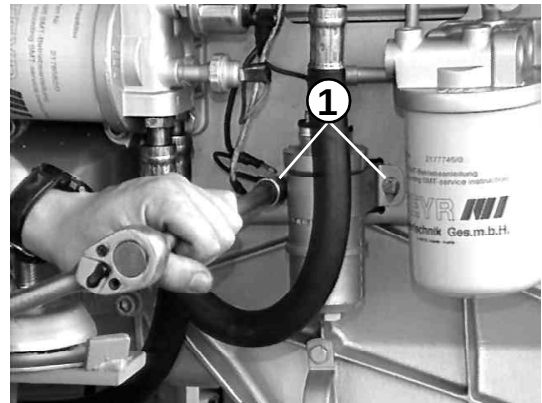
● For 6. cyl. engines only (item 4-7)

- 4 Mount bracket in correct position onto new fuel pump. Tighten screws of bracket.
- 5 Mount pump and ground wire on filter plate and fix with two hexagon screws (ill.10/pos.1). Tighten screws with a standard torque of **10 Nm +/-1**. Torque wrench No. 2300704/0. Fix ground cable together with bracket.
- 6 Mount adaptor with Cu-sealing rings at top face of fuel pump.
- 7 Attach fuel lines between filter and pump, as well as pump and block. Tighten hollow screws with a torque of **30 Nm +/-3**.

ATTENTION: Hold up with second wrench on hexagon of pump housing, to avoid a damage to the E-pump.
Always use new Cu-sealing rings.



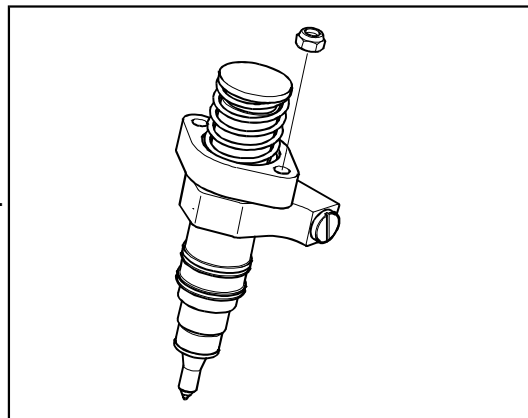
- 8 Connect two cables to negative terminal (-) and to positive terminal (+). Cover the two terminals with neoprene lacquer sealing No. P/N Z909570/0.
- 9 Connect battery cables.
- 10 Connect fuel lines and operate electric fuel pump 3 times for 10 sec., to bleed fuel system.
- 11 Check fuel system for leakage.
(No. 2300719/1, mount fuel return line)



02.01 ill.10

03.02.02 Disassembly and assembly of unit injector

Preparation: Remove camshaft housing cover.
Clean sealing surface of rubber seal and check for hardening and damage.
Replace seal, if required.

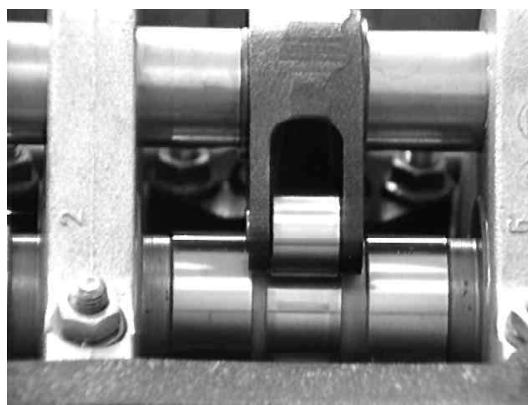


02.02 ill.1

- 1 Turn crankshaft until injector cam is at base circle as well intake and exhaust valve are open, in order to permit a lateral shifting of rocker arm.



02.02 ill.2



02.02 ill.3

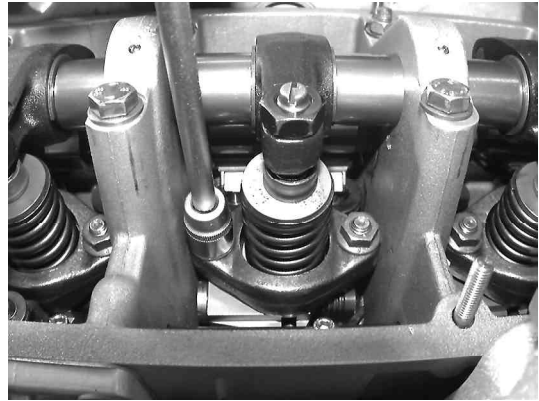
- 2 Before loosening flange nuts of unit injectors, ventilate fuel system. For this purpose, open screw of banjo fitting just enough to let air through seal rings between fuel filter and fuel pump (ill.4/pos.1), and let pump run approx. 6 times for 10 sec. Make sure that air is sucked.

ATTENTION: Close fuel cock on tank, if tank is higher than fuel supply on filter head.



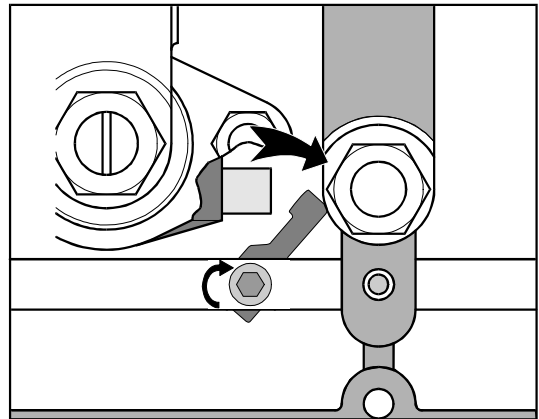
02.02 ill.4

- 3 Remove nuts on unit injector flange (2 hexagon nuts SW 13).



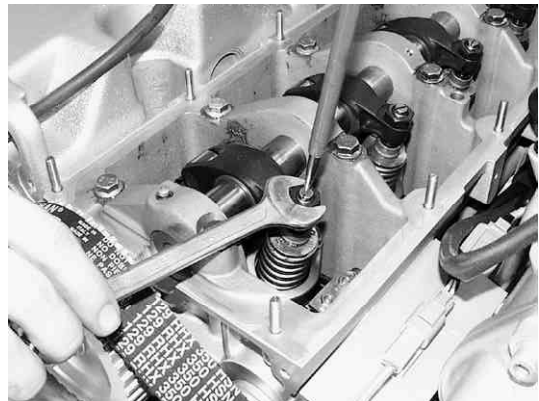
02.02 ill.5

- 4 Loosen **left-handed** hexagon socket securing the control link on the control rack by using a 4 mm hexagon socket wrench. Turn control link against bulk head. (1 hexagon socket SW 4 - "**LEFT-HAND THREAD**" per unit injector).



02.02 ill.6

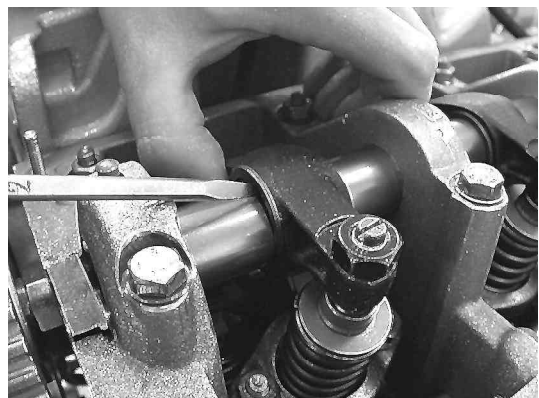
- 5 Loosen adjusting nut with 17 mm socket wrench (hexagon nut SW 17 and screwdriver). Turn adjusting screw to such an extent that the slide cup is loosely attached to the spring plate. Do not remove.



02.02 ill.7

- 6 Insert screwdriver with small blade into recess of retainer ring (half-moon ring) for rocker arm lock, push retainer ring upwards and remove.

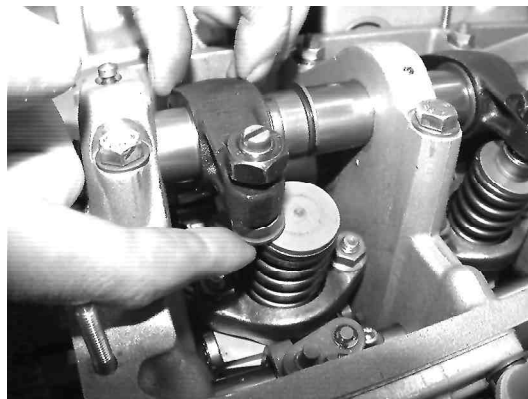
For disassembly of unit injector, always remove rocker arm retaining ring at timing belt side.



02.02 ill.8

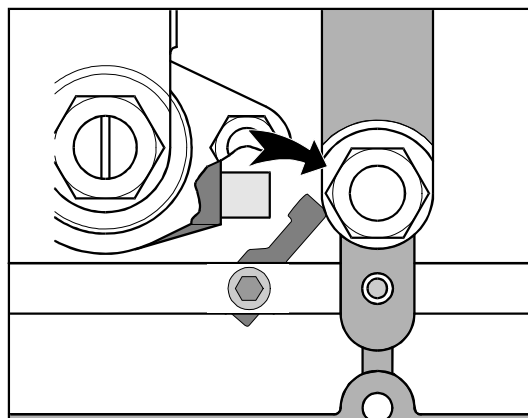
- 7 Move the rocker arm towards timing belt side of engine and remove the tappet.

NOTE: Adjusting screw and slide cup match exactly and thus have to be removed kept matched.



02.02 ill.9

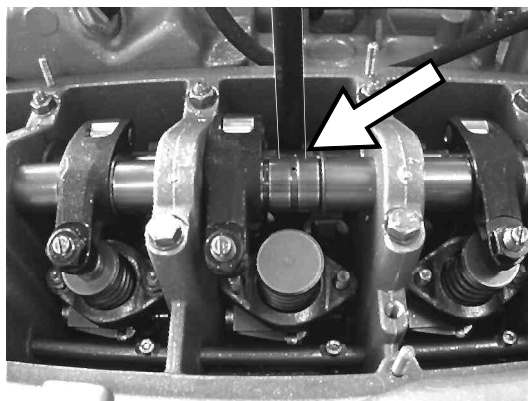
- 8 Check position of control link(s) against bulkhead as illustrated.



02.02 ill.10

- 9 Insert the unit injector lever SMO No. VR00126/0 below the camshaft and push upwards against the body of unit injector. The unit injector is thus lifted out from the engine block and may be removed manually.

NOTE: For disassembly of the unit injector from cylinder No. 1, the control rack is to be moved forward.



02.02 ill.11

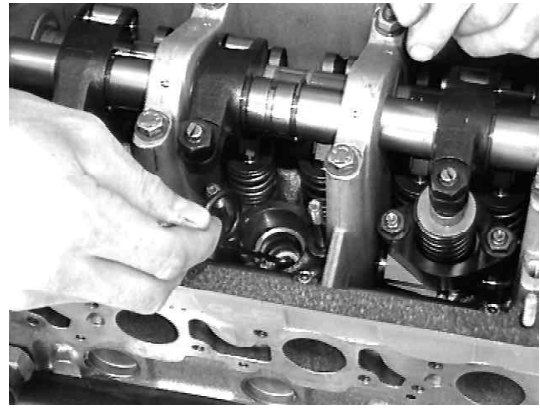
- 10 Remove unit injector with mounting flange.



02.02 ill.12

- 11 Remove copper seal washer from bottom side of copper insert by means of hook- and lifting tool (No. VR 00116/0).

NOTE: Avoid scratches on the sealing surface of the copper insert.



02.02 ill.13

Assembly

- 1 In order to secure an appropriate tight fit, recheck tighten stud bolt with a torque of

21 Nm +/- 2



02.02 ill.14

- 2 Drain possible fuel residues by means of suction device No. VR 00121/0 from the combustion chamber. Suction device must be equipped with a suction hose of at least 250 mm of length in order that possible fuel residues can be sucked from piston recess.

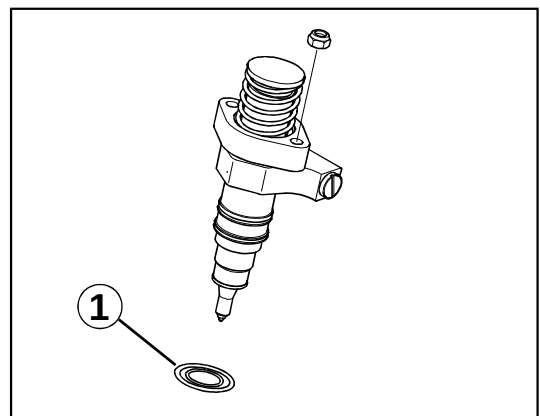
NOTE: Fuel residues in the combustion chamber may cause severe damage to the engine.



02.02 ill.15

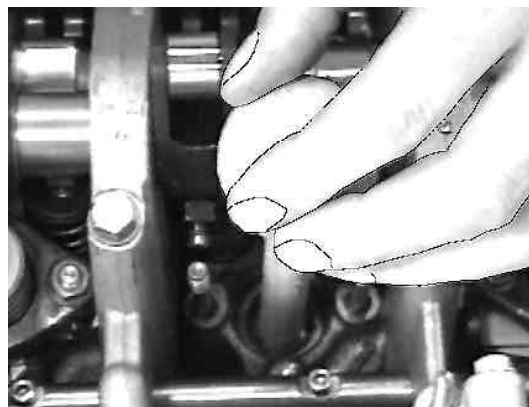
- 3 Check copper insert for possibly remaining seal washers; remove and dispose, if necessary.

NOTE: Always use new copper seal washers! (ill.16/pos.1)



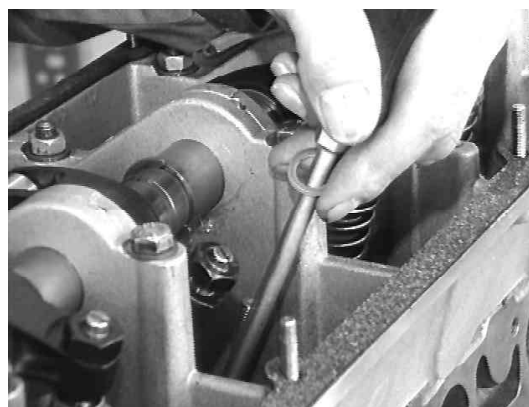
02.02 ill.16

- 4 Clean conical part of copper insert with cleaning mandrel No. 2300565/0. For this purpose,, turn cleaning mandrel several times in both directions and then clean copper insert with cleaning tissue.



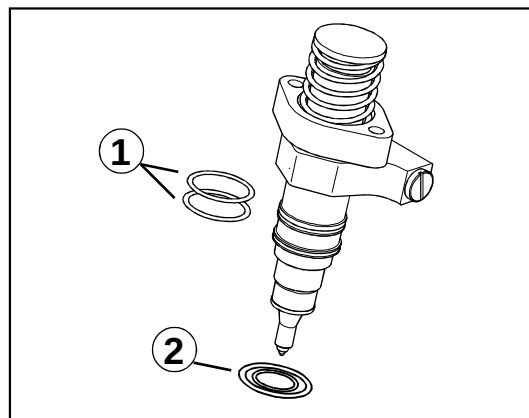
02.02 ill.17

- 5 **ATTENTION:** Insert new special copper seal washer (ill.19/pos.2), from seal kit Z002031/0, with a screwdriver into copper insert.
Make sure the copper seal washer is plane.



02.02 ill.18

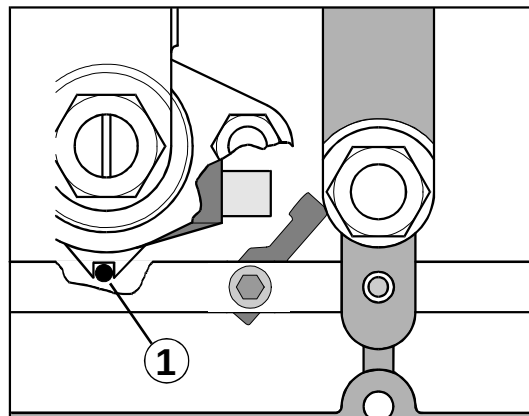
- 6 Install new O-rings (ill. 19/pos.1), from seal kit Z002031/0, and cover O-rings with a thin coat of clean motor oil.



02.02 ill.19

- 7 Insert unit injector into bore and align unit injector recess to dowel pin (ill. 20/pos.1) for positioning. Avoid any contact with control link.

ATTENTION: Risk of damage to control rack.



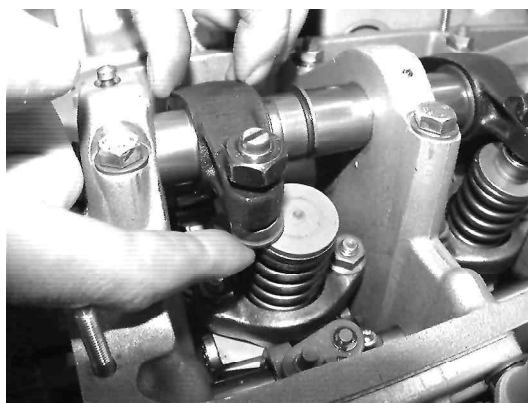
02.02 ill.20

- 8 Push unit injector firmly downwards in order to position it correctly with the O-rings.



02.02 ill.21

- 9 Lubricate slide cup with motor oil, put it onto adjustment screw, as shown, and shift it together with rocker arm onto unit injector.



02.02 ill.22

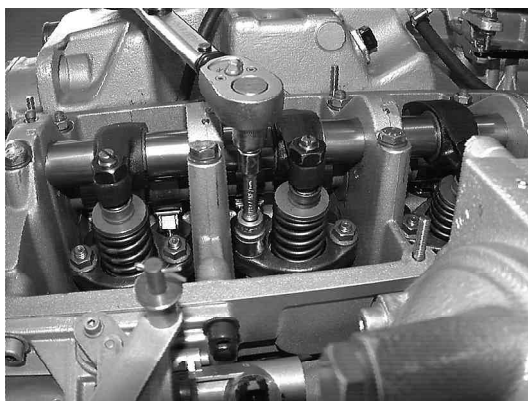
- 10 Install retainer ring to secure the rocker arm.



02.02 ill.23

- 11 Screw on flange nuts (hexagon nuts SW 13) and tighten evenly. Absolutely tighten nuts with a torque of **18 I-2 Nm**.

ATTENTION: Pay attention to horizontal installation of mounting flange.



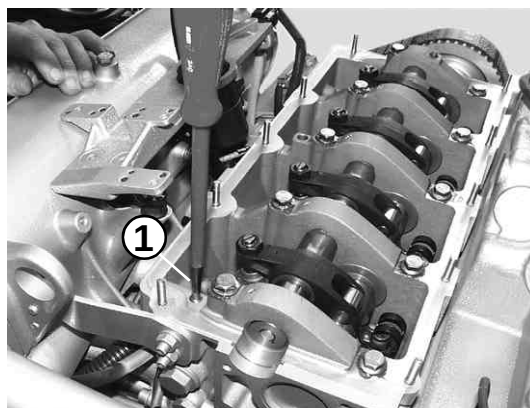
02.02 ill.24

- 12 Fix control rack.
- 13 Attach control link to control rack and adjust.
Refer to 03.02.04, Adjusting Control Link.
- 14 Adjust injection start. Refer to 03.02.06, Injection
Start unit injector.
- 15 Connect fuel pipes and operate electric fuel pump 3
times for 10 seconds to vent fuel system.

03.02.03 Fix control rack

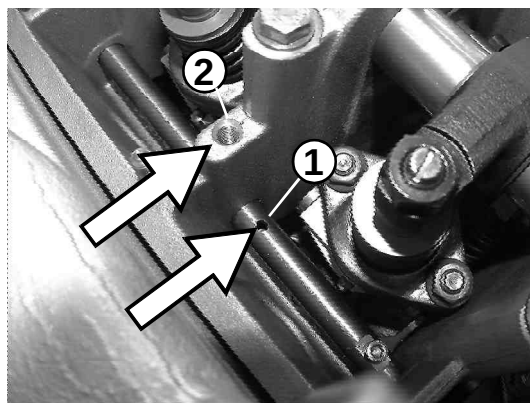
Preparation: Remove camshaft housing cover, refer to 01.00.02

- 1 Unscrew setpin of control rack (ill.1/pos.1) at the back of camshaft housing, as shown.



02.03 ill.1

- 2 Position bore (diameter 4 mm) in control rack(ill.2/ pos.1) over reference bore (ill.2/pos.2) in the bulkhead wall.

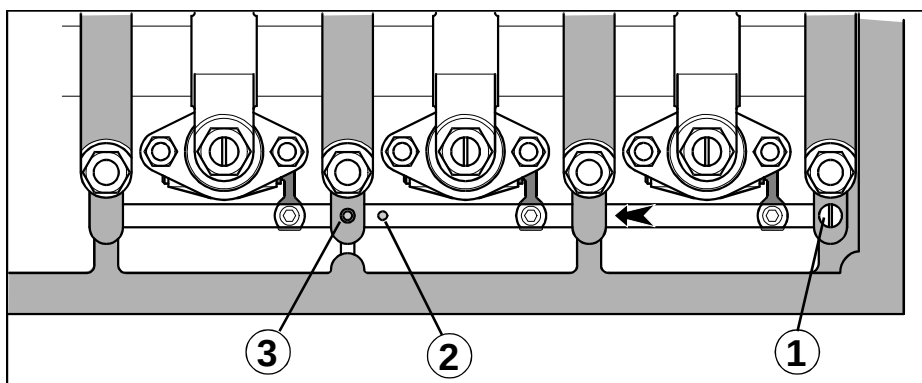


02.03 ill.2

- 3 Pull control rack manually to the front, against spring resistance, and hold. Insert setpin, as shown, and fasten sturdily.



02.03 ill.3



02.03 ill.4

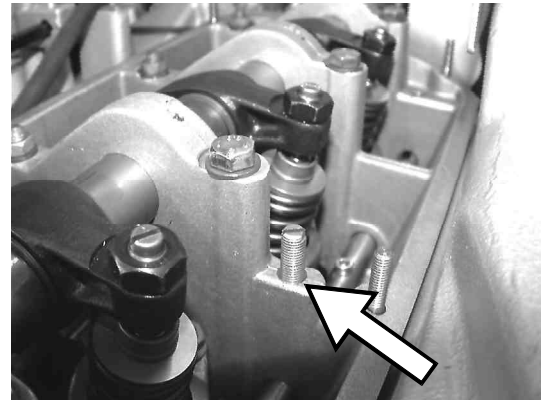
03.02.04 Adjust Control Link (injection quantity)

Prior to adjustment, unit injector must be tightened properly, and control rack must be fixed in position with set pin.

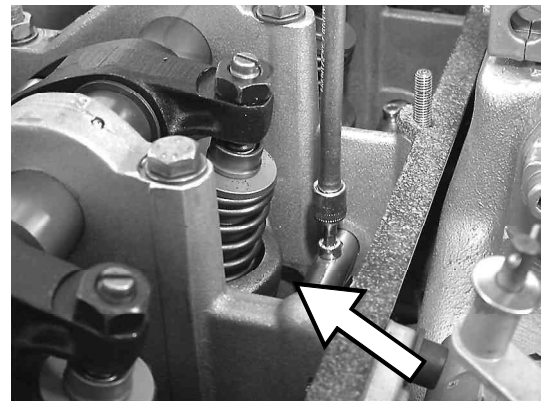
NOTE: Readjust all control links even if only one link has been opened.

STARTING POSITION:

Loosen **left-handed** setscrew of control link. Turn control link against bulkhead on camshaft housing.

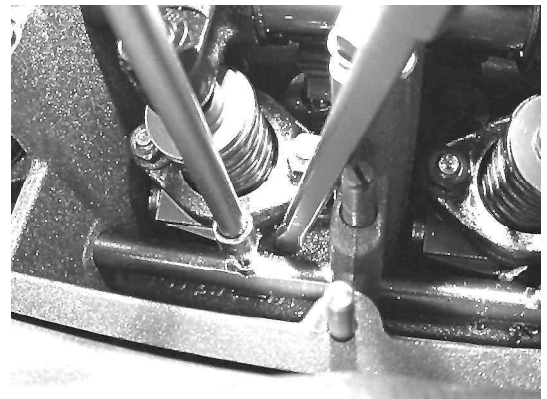


02.04 ill.1



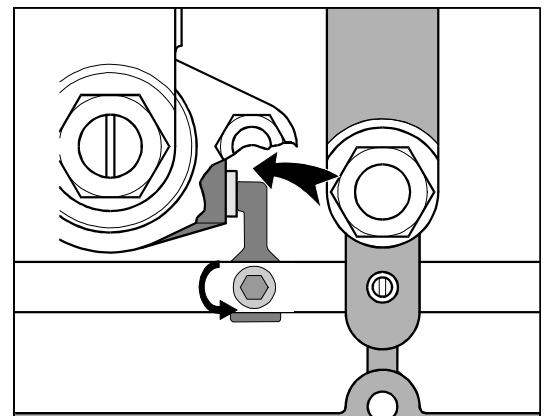
02.04 ill.2

- 1 Carefully position end of control link on front side of unit injector control rack (possibly use screwdriver).
- 2 Turn control link against unit injector control gear until control gear completely pushes against upper gauged stop and hold position with screwdriver. Hold in this position and tighten **left-handed** setscrew of control link with a torque of **7 Nm +/-0,5**. Repeat steps 1 and 2 for the rest of unit injector control racks.



02.04 ill.3

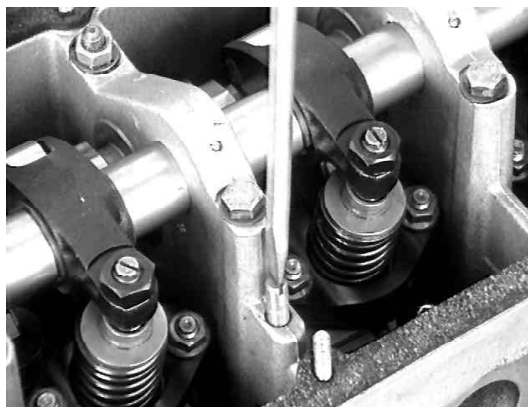
- 3 Calibrate rack position, refer to 06.10.03
- 4 Loosen fixing of control rack, refer to 03.02.05



02.04 ill.4

03.02.05 Loosen fixing of control rod

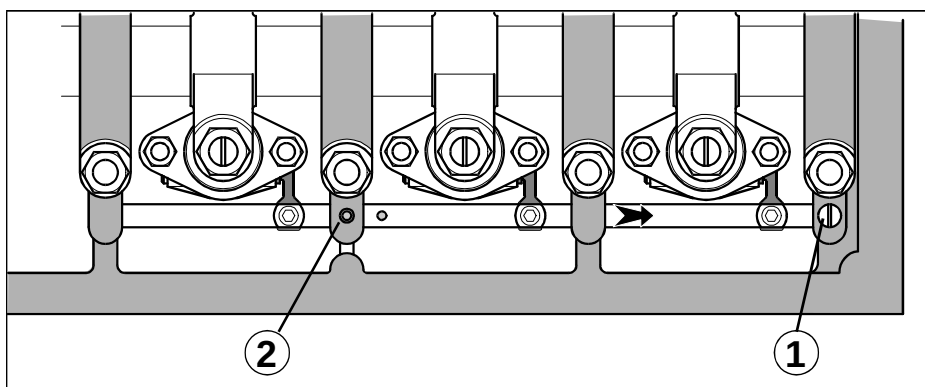
- 1 Unscrew setpin (ill.3/pos.2) from bulkhead wall with removing setpin and hold control rack. Reinstall setpin in rear camshaft housing bore.(ill.3/pos.1).
- 2 Tighten setpin with a torque of **7 Nm**.
- 3 Check axial flexibility of control rack. Control rack is to be moved easily and should automatically return to reverse position due to spring load.



02.05 ill.1



02.05 ill.2



02.05 ill.3

03.02.06 Adjust start of injection

Preparation: Remove camshaft housing cover

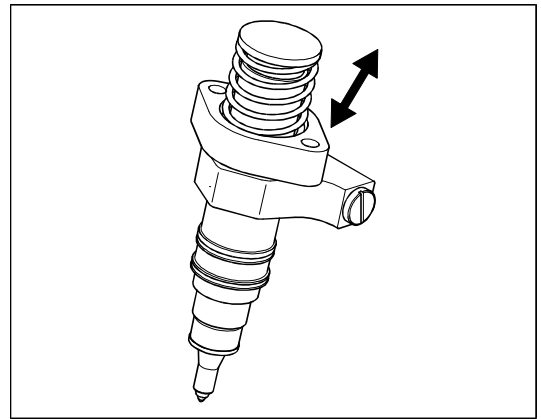
NOTE: The adjustment of start of injection is necessary:

- if unit injector was removed
- periodically according to maintenance (chart)
- if set value has changed (see chart Set Values Unit Injector Stroke).

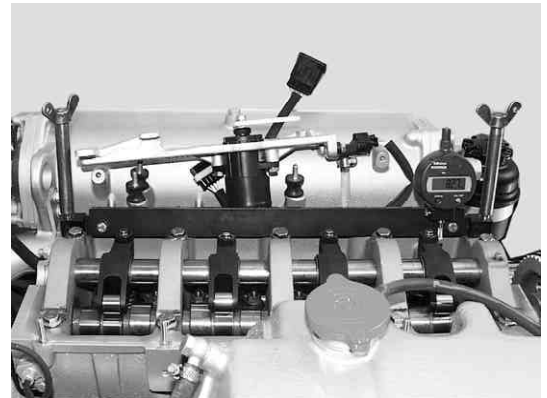
Adjustment of injection start is to be done prior to adjustment of engine control.

Special tool.: 2306031/4 dial gauge rail 4 cyl.
2306031/1 dial gauge rail 6 cyl. with bossed seal surface
2306031/6 dial gauge rail 6 cyl. with plane seal surface
2300899/0 dial gauge
2300641/1 probe pin

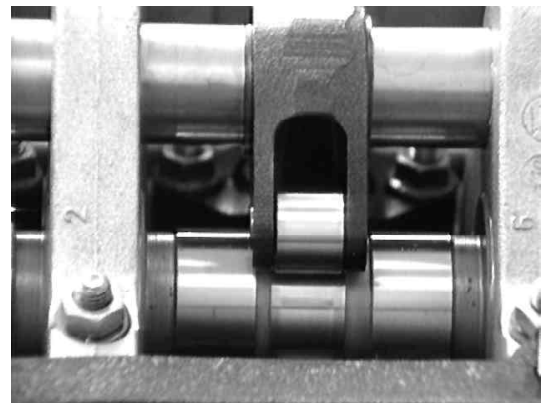
- 1 Unit injector must be installed properly and fastened. Control rack and unit injector control gear must be free to move.
- 2 Put dial gauge rail with bracket, No. 2306031/. (see list special tool), onto stud bolt at intercooler side of camshaft housing and fasten with nuts.
- 3 Turn camshaft until bearing rollers of rocker arm for unit injector being adjusted is on the base circle of the cam. Unit injector spring should be in most relaxed position.
- 4 Mount dial gauge No. 2300899/0 with pointer No. 2300641/1 into dial gauge rail.
- 5 Put pointer onto unit injector plunger guide.



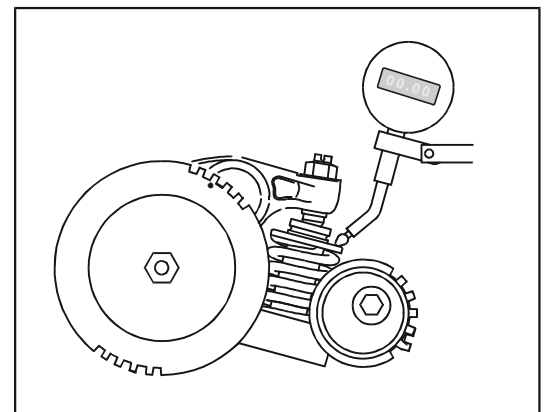
02.06 ill.1



02.06 ill.2



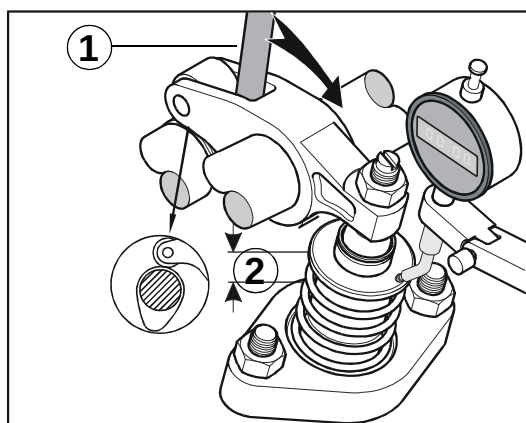
02.06 ill.3



02.06 ill.4

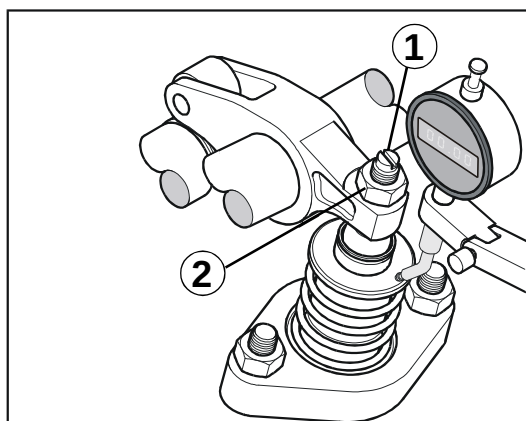
- 7 Insert unit injector extracting lever No. VR 00126/0 (ill.5/pos.1) in recess of rocker arm between rocker arm body and roller, as shown, and fully press down spring of unit injector. Set display to zero.

NOTE: Slowly release unit injector spring. Read total indicating travel (ill.5/pos.2) on dial gauge.



02.06 ill.5

- 8 Turn adjusting screw (ill.6/pos.1) with screwdriver and set to the value as listed in below table. Hold adjusting screw in this position and tighten hexagon nut (ill.6/pos.2) by means of torque wrench No. 2300743/0 and tee-handled socket wrench (SW17) with a torque of **30 Nm +/-3**.



02.06 ill.6

Engine setting values for engines with a build date before 2007 (<48226999/<68226999)

TYPE	Unit Injector	Stroke Adjustment		Engine Timing	Valve Clearance
		New Copper Ring / Control Value			Inlet &Outlet
M094K32	2176555/5	8,27	8,32	3,20	0,25/0,25
M0114K33	2176555/5	8,27	8,32	3,20	0,25/0,25
M0144M38	2176555/5	8,27	8,32	3,20	0,25/0,25
M0144V38	2176555/5	8,27	8,32	3,20	0,25/0,25
M0164M40	2176557/0	8,27	8,32	3,20	0,25/0,25
MO174V40	2176557/0	8,07	8,12	3,20	0,25/0,25
MO126K28	2176555/5	8,27	8,32	3,20	0,25/0,25
MO166K28	2176555/5	8,27	8,32	3,20	0,25/0,25
MO236K43	2176555/5	8,27	8,32	3,20	0,25/0,25
MO246M41	2176557/0	8,27	8,32	3,20	0,25/0,25
MO256H45	2176557/0	8,27	8,32	3,20	0,25/0,25
MO256K43	2176557/0	8,27	8,32	3,20	0,25/0,25
MO266K43	2176557/0	8,07	8,12	3,20	0,25/0,25
Tolerance:		+/- 0,02	+/- 0,02	+/- 0,05	

Engine setting values for engines with a build date from 2007 (>48227001/>68227001)

TYPE	Unit Injector	Stroke Adjustment		Engine Timing	Valve Clearance
		New Copper Ring / Control Value			
MO84K32	2176555/5	8,47	8,52	3,20	0,25/0,25
MO94K33	2176555/5	8,47	8,52	3,20	0,25/0,25
MO114K33	2176557/0	8,47	8,52	3,20	0,25/0,25
MO144V38	2176557/0	8,47	8,52	3,20	0,25/0,25
MO144M38	2176557/0	8,47	8,52	3,20	0,25/0,25
MO164M40	2176557/0	8,37	8,42	3,20	0,25/0,25
MO174V40	2176557/0	8,47	8,52	3,20	0,25/0,25
MO126M28	2176555/5	8,57	8,62	3,20	0,25/0,25
MO126K28	2176555/5	8,57	8,62	3,20	0,25/0,25
MO166M28	2176557/0	8,57	8,62	3,20	0,25/0,25
MO166K28	2176555/5	8,57	8,62	3,20	0,25/0,25
MO196K35	2176555/5	8,47	8,52	3,20	0,25/0,25
MO236K42	2176557/0	8,37	8,42	3,20	0,25/0,25
MO236K43	2176555/5	8,47	8,52	3,20	0,25/0,25
MO256H45	2176557/0	8,27	8,32	3,20	0,25/0,25
MO256K43	2176557/0	8,27	8,32	3,20	0,25/0,25
Tolerance:		+/- 0.02	+/- 0.02	+/- 0.05	

- 9 Recheck stroke adjustment, recheck zero value and total stroke adjustment as described in steps 7 and 8.

ATTENTION: In case of deviation, repeat setting process.

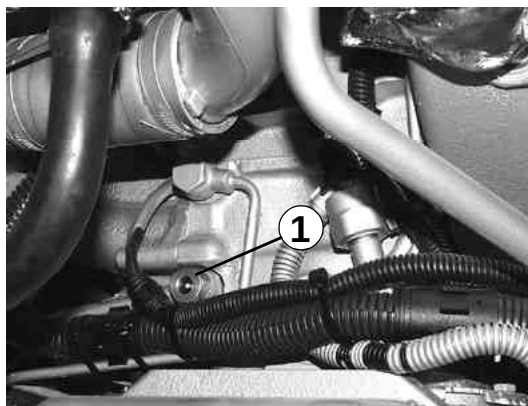


03.02.07 Exchange check valve for fuel pre- pressure to unit injector

1. Unscrew valve SW 19 mm (ill.1/pos.1), remove 2 Cu-sealing rings.

NOTE: Use new Cu-sealing rings for assembly. Tighten with a torque of **40 Nm +/-4.**

ATTENTION: On account of importance of this valve (proper function of fuel system), only use **genuine STEYR spare part** for possible exchange.

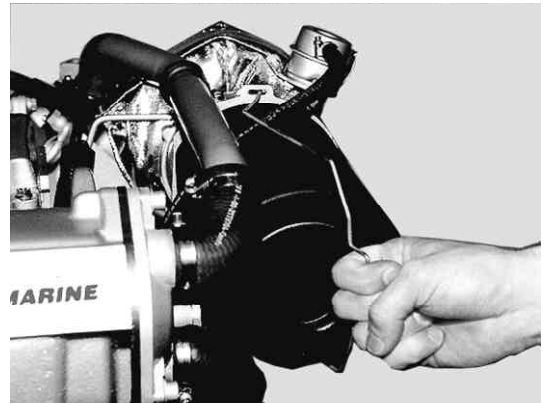


02.07 ill.1

03.04 CHANGE AIR FILTER**03.04.01 Change air filter**

**Till engine serial no. 48219069 (4-cyl.)
and 68219174 (6-cyl.)**

- 1 Open retaining clip.



04.01 ill.1

- 2 Remove air filter and cover.
- 3 Put new air filter together with cover onto filter head and fix with retaining clip.



04.01 ill.2

**From engine serial no. 48219070 (4-cyl.)
and 68219175 (6-cyl.)**

- 1 Remove hose clamp and air filter.
- 2 Mount new air filter together with hose clamp and tighten clamp solid.

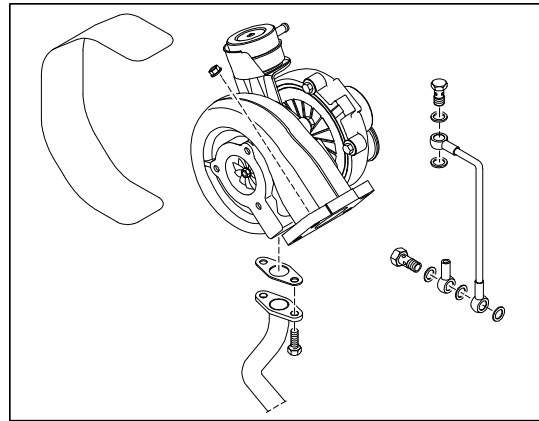


04.01 ill.3

03.05 TURBOCHARGER

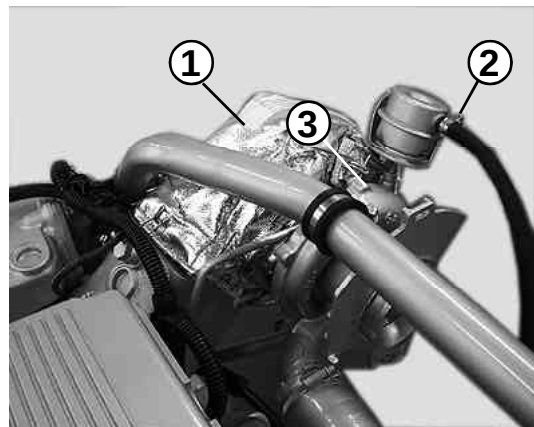
03.05.01 Replace turbocharger

- 1 Remove air filter, refer to 03.04.01
- 2 Remove high-riser, refer to 04.01
- 3  **For 6 cyl. engines only**
Drain coolant from closed cooling circuit, refer to 05.00.07



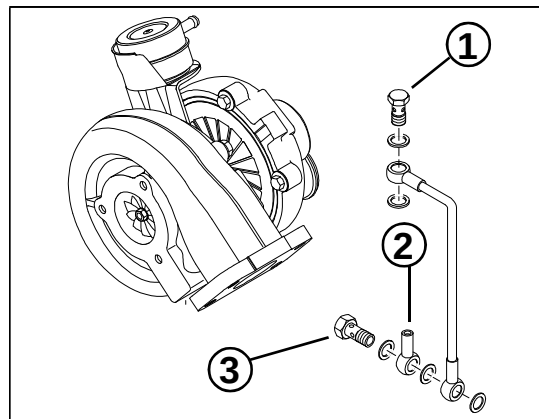
05.01 ill.1

- 4  **For 4 cyl. engines only (item 4-7)**
- 4 Loosen fastenings of heat protection. Remove heat protection (ill.2/pos.1).
- 5 Loosen hose clamp (ill.2/pos.2) and remove hose for air charge pressure box.
- 6 Loosen screw (ill.2/pos.3) for raw-water pipe support (SW10).



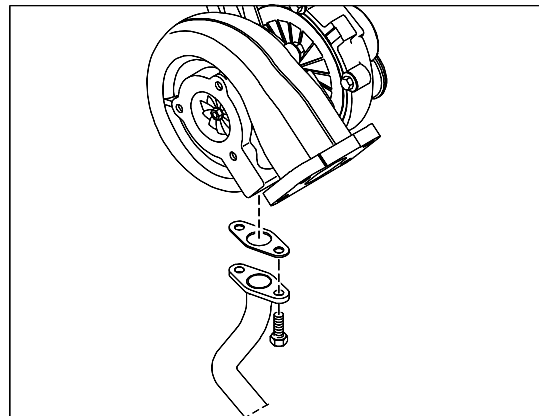
05.01 ill.2

- 7 Loosen hollow screw (ill.3/pos.1) of oil feed line on turbocharger.
- 8 Remove plug of oil pressure switch (ill.3/pos.2).
- 9  Loosen hollow screw (ill.3/pos.3) of oil feed line on motorblock. Dispose Cu-sealing rings.



05.01 ill.3

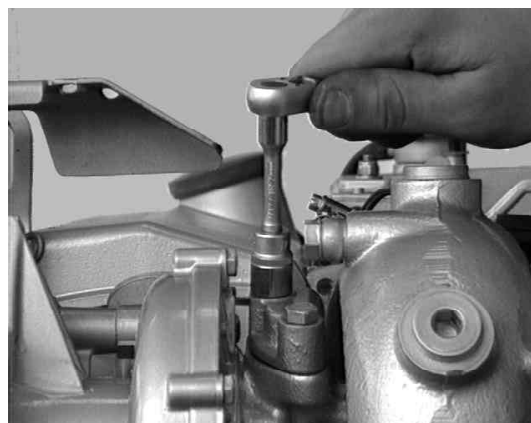
- 10 Loosen two hexagon screws (ill.4) of oil return line. Dispose seal.



05.01 ill.4

11 **For 6 cyl. engines only**

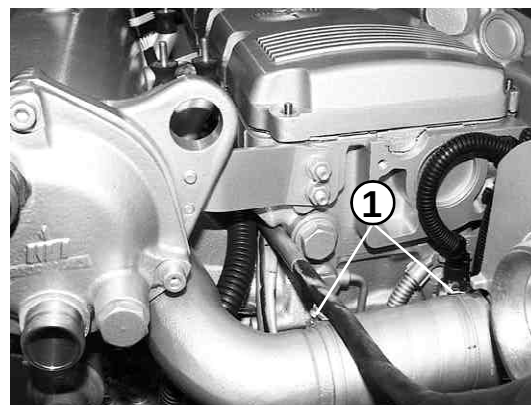
Loosen 2 hexagon screws on flange of oil feed line.



05.01 ill.5

12 **For 4 cyl. engines only**

Loosen hose clamps of hose connection turbocharger-intercooler (ill.6/pos.1) and remove hose.

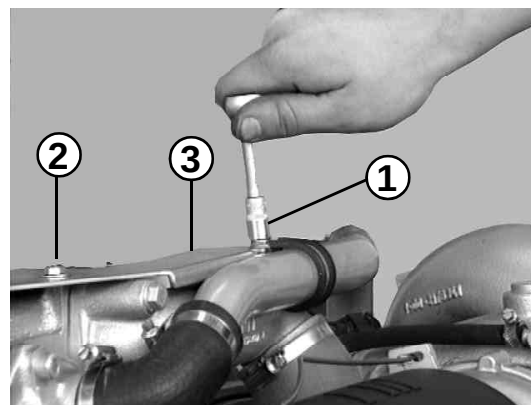


05.01 ill.6

 For 6 cyl. engines only (item 13-17)

13 Loosen support screw (ill.7/pos.1) for raw-water pipe.

14 Remove covering (ill.7/pos.3) to intercooler by loosening 5 hexagon screws (SW10) (ill.7/pos.2).

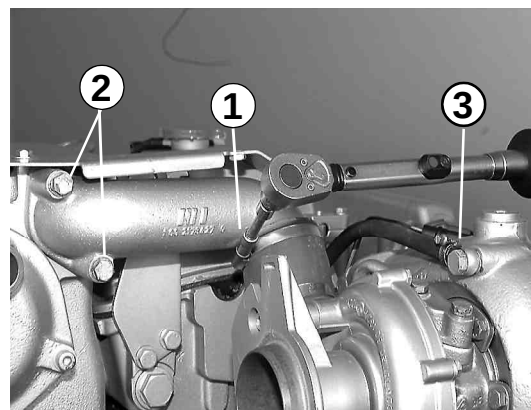


05.01 ill.7

15 Loosen hose clamp (ill.8/pos.1) connection compression housing.

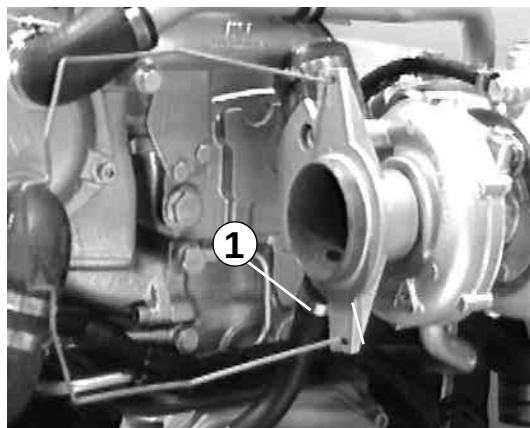
16 Loosen 2 hexagon screws (ill.8/pos.2) and remove connecting bend.

17 Loosen hollow screw (ill.8/pos.3) of cooling system - vent pipe (SW14) . Remove pipe.



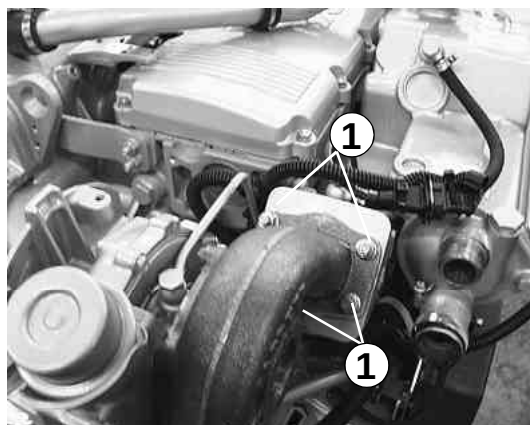
05.01 ill.8

- 18 Loosen hose clamp (ill.9/pos.1) of hose of oil separator and remove hose.



05.01 ill.9

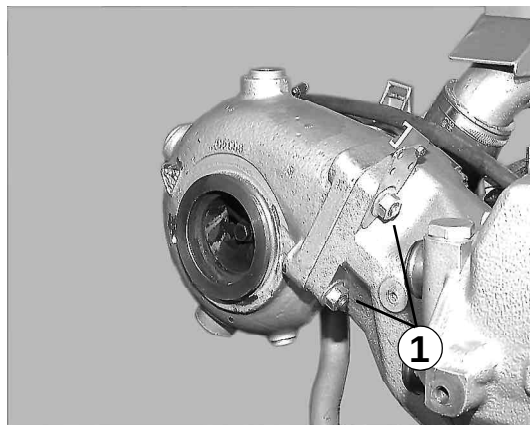
- 19 Loosen 4 hexagon nuts (ill.10+11/pos.1) of turbocharger flange. Remove turbocharger and seal, dispose seal. (if seal is used)



05.01 ill.10

Assembly:

ATTENTION: Check hose connection and hose between turbocharger return pipe and engine housing intake for crack and damage. Replace, if necessary.



05.01 ill.11

- **For 4 cyl. engines only :** Clean sealing surface of flange turbo charger and exhaust manifold and lubricate with grease Z012222/0.
- **For 6 cyl. engines only:** Clean sealing surfaces of flange turbo charger and exhaust manifold. Replace flange seal.

Further assembly is done in reverse order.

ATTENTION: Tighten the two spring-clamps of hose turbocharger - intercooler with a torque of 3,5 Nm. Don't strip!



● **For 4 cyl. engines only (item 1-2)**

- 1 Tighten 4 hexagon nuts of turbocharger flange with a torque of **25 Nm +/-2**.
- 2 Tighten 2 screws for fixing the flange of oil return pipe with a torque of **10 Nm +/-1**.
Tighten hollow screw with **25 Nm +/-3**.

● **For 6 cyl. engines only (item 3-6)**

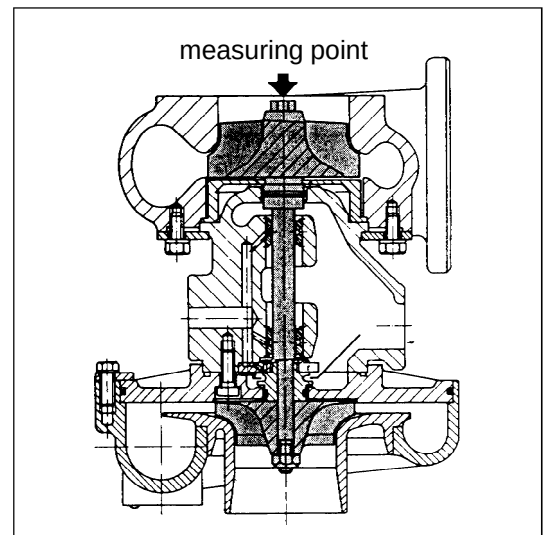
- 3 Tighten 4 hexagon nuts of turbocharger flange by means of torque wrench No. 2300743/0 and tree-handled socket wrench No. 2300744/0 with a torque of **40 Nm +/-4**.
- 4 Tighten 2 screws for fixing the oil return pipe flange with a torque of **23 Nm +/-2**.
Tighten hollow screw with **40 Nm +/-4**.
- 5 Tighten hollow screw of vent pipe (cooling circuit) with a torque of **20 Nm +/-2** . Maintain horizontal position of banjo fitting while tightning hollow screw.
- 6 Fill closed cooling circuit, refer to 05.00.08

03.05.02 Check bearing clearance

Measure end clearance:

- 1 Put test prod of dial gauge onto face of turbine wheel hub.
- 2 Push cursor downwards and set dial gauge to "0".
- 3 Push cursor against dial gauge and note deflection of pointer.

permissible end clearance: max. 0.16 mm +/-0,01



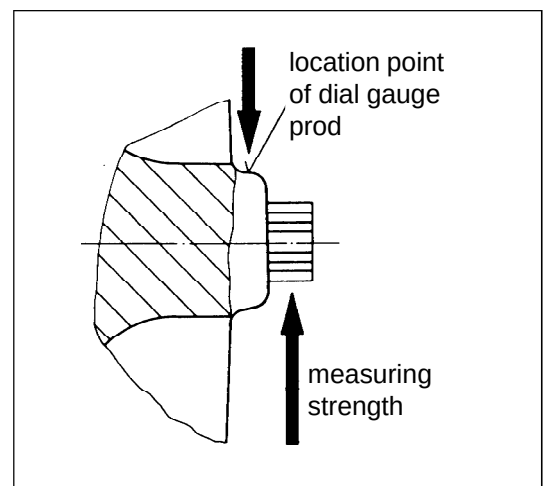
05.02 ill.1

Measure radial clearance:

NOTE: Determination of radial clearance is only required turbine-sided.

- 1 Put test prod of dial gauge onto center of retainer cone of turbine wheel.
- 2 Pull turbine wheel hub upwards by means of spring balance. **Measuring strength 50 N.**
- 3 Note deflection of pointer.
- 4 Repeat measurement, by turning cursor by 90°.

Permissible radial clearance: max. 0.42 mm +/-0,04



05.02 ill.2

03.08 CONTROL SOLENOID**03.08.01 Remove control solenoid**

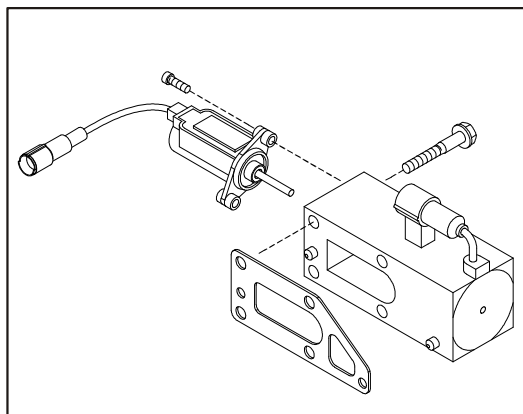
Preparation: **for 4 cyl. engines only**
remove intercooler,
refer to 01.08.01.

- 1 Disconnect battery.

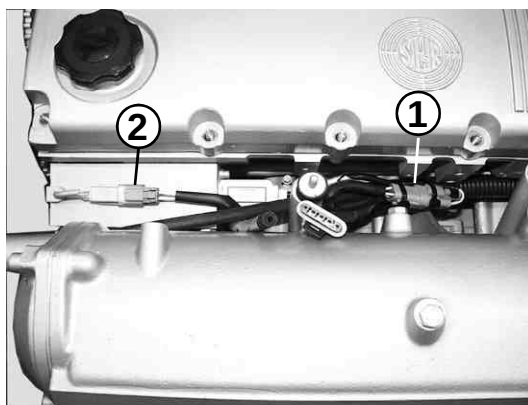


For 4 cyl. engines only (item 2-3)

- 2 Loosen plug connection (ill.2/pos.1) for control rack potentiometer.
- 3 Remove plug from control solenoid (ill.2/pos.2).



08.01 ill.1

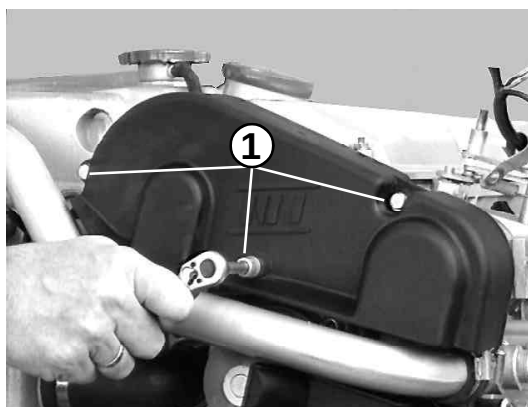


08.01 ill.2

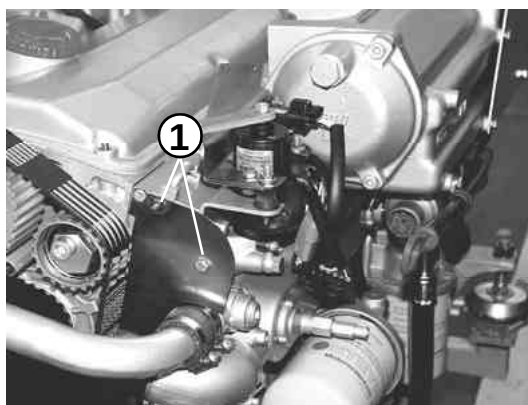


For 6 cyl. engines only (item 4-11)

- 4 Unscrew 3 hexagon screws (SW10) (ill.3/pos.1) of upper timing belt covering.
- 5 Unscrew 2 hexagon screws (SW10) (ill.4/pos.1) of front control solenoid covering.

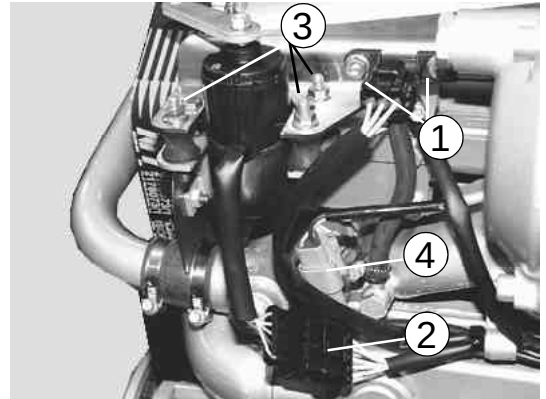


08.01 ill.3

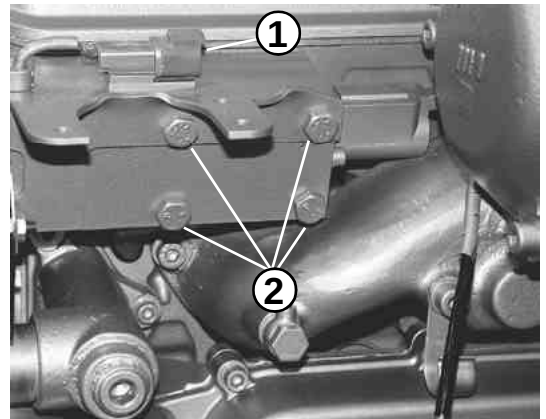


08.01 ill.4

- 6 Loosen 2 hexagon nuts (SW10) (ill.5/pos.1). Remove boost pressure sensor.
- 7 Loosen plug (ill.5/pos.2) for potentiometer accelerator.
- 8 Loosen 3 hexagon nuts (SW10) (ill.5/pos.3). Remove bracket with potentiometer accelerator.
- 9 Remove plug (ill.5/pos.4) for sensor of control rod.
- 10 Remove plug (ill.6/pos.1) from control solenoid.
- 11 Loosen 4 hexagon screws (SW13) (ill.6/pos.2) on control solenoid housing; Remove control solenoid assembly. Remove seal and dispose.



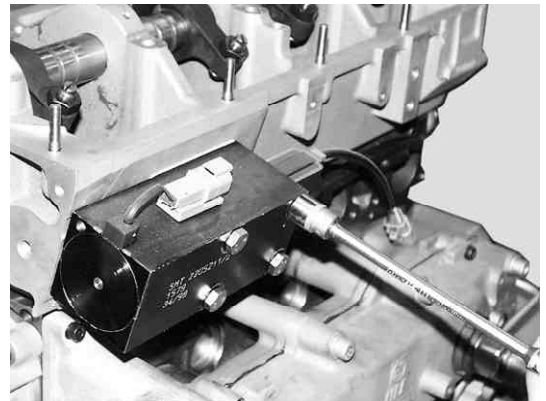
08.01 ill.5



08.01 ill.6

 For 4 cyl. engines only

- 12 Loosen 4 hexagon screws (SW13) (ill.7) on control solenoid housing, remove control solenoid assembly. Remove seal and dispose.



08.01 ill.7

03.08.02 Install control solenoid

To install control solenoid assembly onto camshaft housing, proceed as follows:

NOTE: Use new gasket for control solenoid if fitted.
O-ring can be re-used.

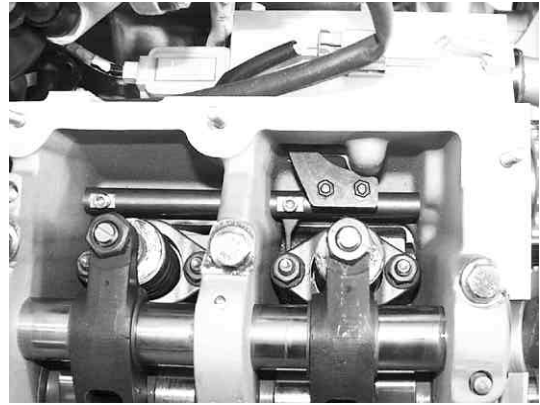
- 1 Remove camshaft housing cover.
- 2 Move control rack by hand (ill.1) to front position and hold.
- 3 Insert control rack lever in to the solenoid as shown. (ill.2/pos.1)
- 4 Bring up control solenoid assembly parallel to sealing surface of camshaft housing, put it onto the dowel pin(s) (ill.3/pos.1) and hold.
- 5 Slowly release control rack and fasten control solenoid housing by means of 4 screws.
- 6  **For 4 cyl. engines only**
Secure the 4 screws with LOCTITE 243 and tighten with a torque of **23 Nm +/-2**.
- 7  **For 6 cyl. engines only (item 8-9)**
Cover the two lower screws with LOCTITE 243 and slightly tighten.
- 8 Cover the two upper screws with LOCTITE 243. Bring into position bracket with potentiometer accelerator and fix with upper screws. Tighten the 4 screws with a torque of **23 Nm +/-2**.
- 9 Check whether the control rack can be moved over a distance of **approx. 18 mm**.

ATTENTION: Pin of control rack position sensor is spring-loaded and might easily slip off from the face of control rack lever, during assembly. In such a case, the control rack is blocked and thus prevents resetting to zero delivery
====> **ENGINE FAILURE.**

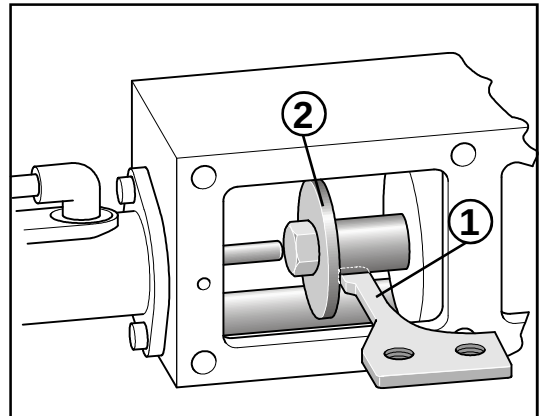


- 10 Remaining assembly is done in reverse order.

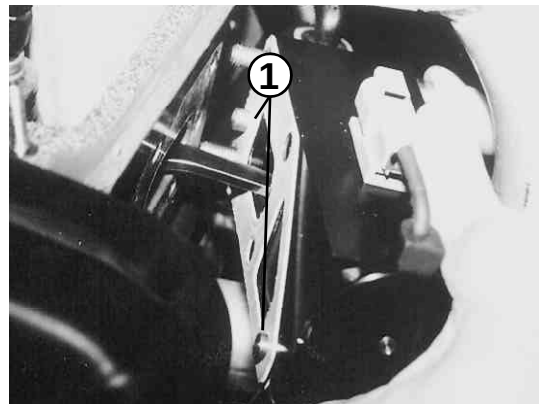
NOTE: The rack position sensor is magnetism sensitive. All external magnets must be kept away as they may disturb the sensor.



08.02 ill.1



08.02 ill.2



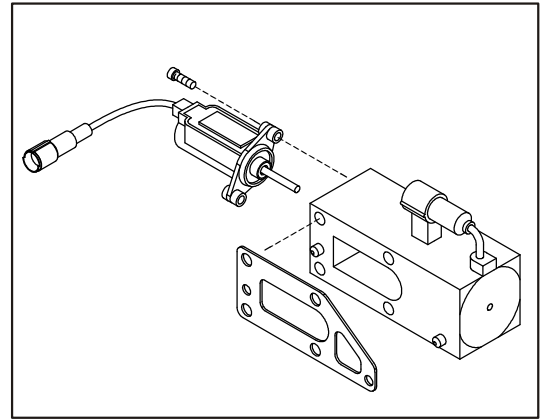
08.02 ill.3

03.08.03 Replace sensor, indication of control rack position

Preparation:

- **For 4 cyl. engines only**
remove shift plate,
refer to 01.08.01, ill.3.
- **For 6 cyl. engines only**
remove bracket of potentiometer
accelerator, refer to 03.08.01, ill. 5-6

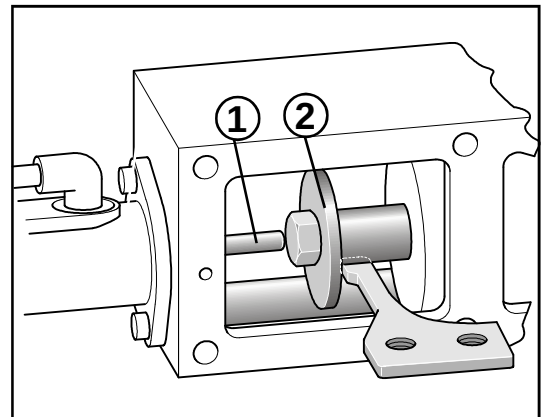
- 1 Loosen 2 Allen head screws (ill.1/pos.1) (SW3).
Remove rack position sensor.



08.03 ill.1

Assembly

- 1 Insert new sensor in such a way that rod of potentiometer (ill.2/pos.1) is positioned in front of solenoid rod (ill.2/pos.2).
- 2 Secure 2 Allen head screws 3 mm with Loctite 243 and tighten with a torque of **5 Nm +/-0,5**.
- 3 Check whether control rack can be moved over a distance of **approx. 18 mm**.



08.03 ill.2

ATTENTION: Rod of rack position sensor is spring-loaded and might easily slip off from the face of solenoid rod (ill.2/pos.2), during assembly. In such a case the control rack is blocked, and thus prevents resetting to zero delivery
==> ENGINE FAILURE.



- 4 Remaining assembly is done in reverse order.

NOTE:

The rack position sensor is magnetism sensitive. All external magnets must be kept away as they may disturb the sensor.

03.09 Change fuel filter

Water or other fuel contaminations may form deposits which clog the fuel filter and may lead to a disturbance. Therefore, change the fuel filter every 300 operating hours and/or every 2 years at least.

- 1 Ventilate fuel system. For this purpose, open fuel pipe between fuel filter and fuel supply (from fuel tank or water separator) on filter head (ill.1/pos.1), and operate the pump approx 6 times each 10 sec. = 6 times 10 sec. ignition ON. Make sure that air is sucked.

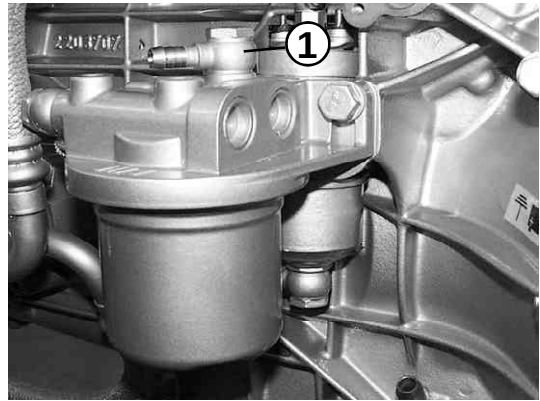
ATTENTION: Close fuel cock on tank, if tank is higher than fuel filter.



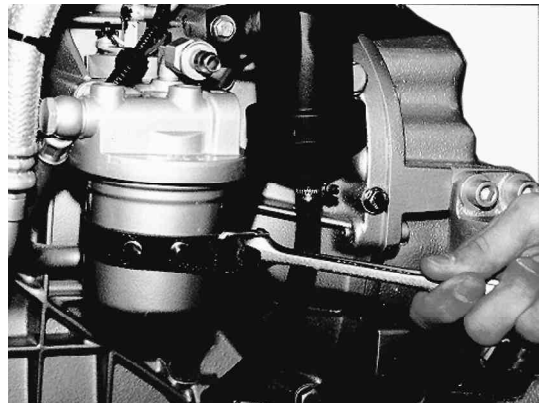
- 2 Unscrew filter (ill.2) by means of filter wrench No. 2300713/1. Remove filter and dispose. Take care that original seal does not adhere to filter housing. If so, remove seal and dispose.
- 3 Clean sealing surface on filter head (ill.3).
- 4 Slightly oil seal of new fuel filter with clean motor oil (ill.4).
- 5 Screw on new fuel filter until seal slightly rests on sealing surface of filter head. Then tighten filter by hand with 3/4 turn.
- 6 Connect fuel pipe between fuel filter and fuel supply or water separator on filter head (ill.1/pos.1) again.
- 7 Ventilate fuel system.

NOTE: Fuel system is ventilated via E-fuel pump.
Turn ignition ON 6 times each 10 sec.

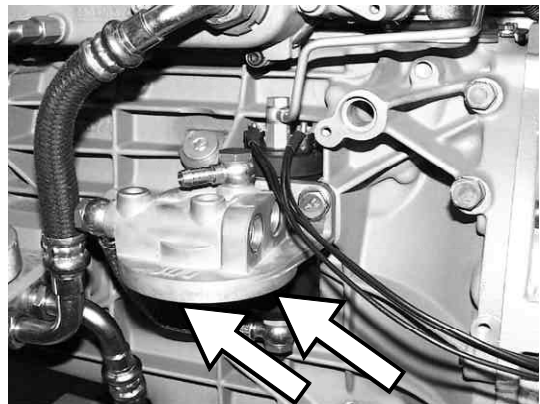
- 8 Remove possibly spilled fuel residues. Start engine and check fuel system for leakage.



09.00 ill.1



09.00 ill.2



09.00 ill.3

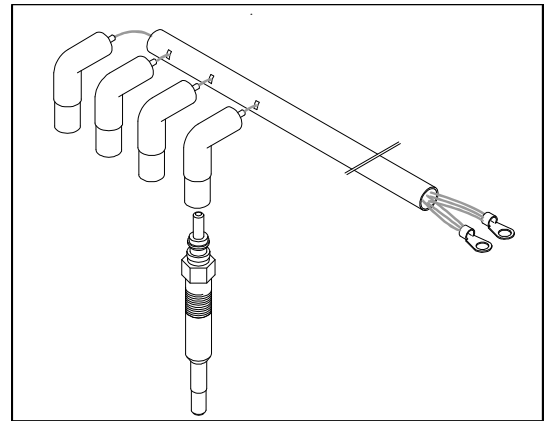


09.00 ill.4

03.11 REPLACE GLOW PLUG

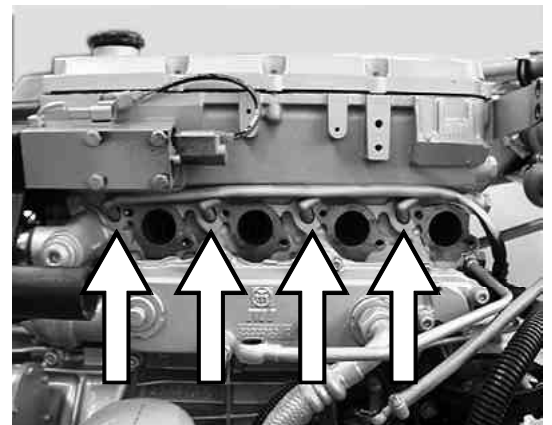
- Preparation:
- **For 4 cyl. engines only**
for glow plug of second to fourth cylinder, remove intercooler - refer to 01.08.01
for glow plug of first cylinder, additionally remove control solenoid - refer to 03.08.01
 - **For 6 cyl. engines only**
for glow plug of first cylinder, remove control solenoid - refer to 03.08.01
for glow plug of second to sixth cylinder, remove intercooler - refer to 01.08.01

- 1 Remove glow plug.
- 2 Unscrew glow plug(s) with special tool No.VR00146/0.
- 3 Screw in new glow plug(s) by means of special tool No. VR00146/0 and tighten by means of special tool No. 2300703/0 with a torque of **15 Nm +/-1**.



11.00 ill.1

NOTE: Exactly keep torque of **15 Nm +/-1** when fixing glow plugs!



11.00 ill.2

03.12 MEASUREMENT OF COMPRESSION PRESSURE

Preparation: remove glow plug, refer to 03.11

- 1 Screw special tool glow plug adaptor 230 0638/2 (ill.1) into cylinder to be checked (ill.2).

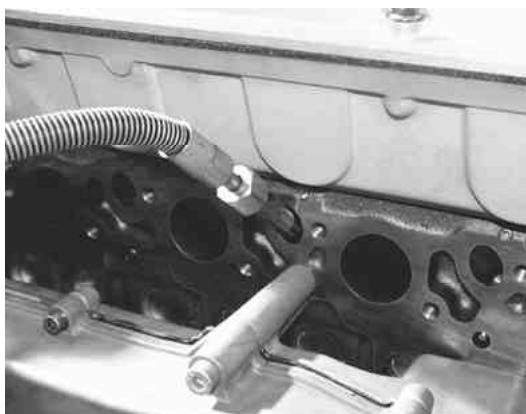


12.00 ill.1

- 2 Connect pressure hose of compression pressure meter No. 2300750/0 to glow plug adaptor (ill.2).

- 3 Connect pressure hose to compression pressure meter No. 2300750/0 (ill.3).

- 4 Remove plug J1.
Connect special tool No. VR00145/0 instead of plug J1.



12.00 ill.2

- 5 Put into operation compression pressure meter according to operating instructions.

- 6 Start engine by pressing the button for 5 to 10 sec. of special tool No. VR00145/0 until compression pressure rises no more.

ATTENTION:



Start with special tool VR00145/0 only. Engine may just turn, but not feed and inject fuel.



12.00 ill.3

Compression pressure for all STEYR MARINE DIESEL ENGINES

NOM. VALUE	LOWER BOUNDARY VALUE
21,0 +/- 1,0 bar	18,0 +/- 1,0 bar

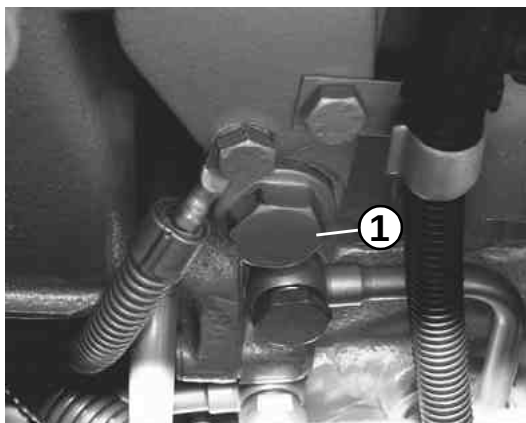
- 7 Assembly is done in reverse order.

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03.14 FUEL SYSTEM CHECK**03.14.01 Manual injection test methode**

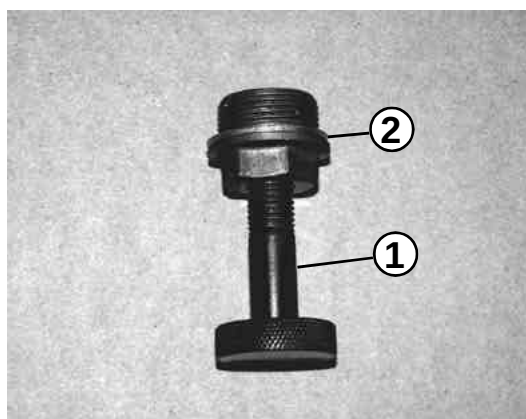
Preparation: Remove camshaft housing cover, refer to 01.00.02

- 1 Remove plug screw (ill.1/pos.1) with sealing ring.



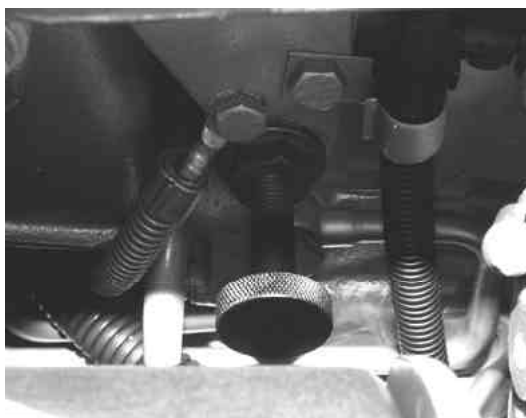
14.01 ill.1

- 2 Mount special tool No. VR00148/0 (ill.2/pos.1) together with sealing ring (ill.2/pos.2).



14.01 ill.2

- 3 Move control rack by means of special tool No. VR00148/0 into idle injection position (approx.5-6 mm) (ill.3) and remain in this position.



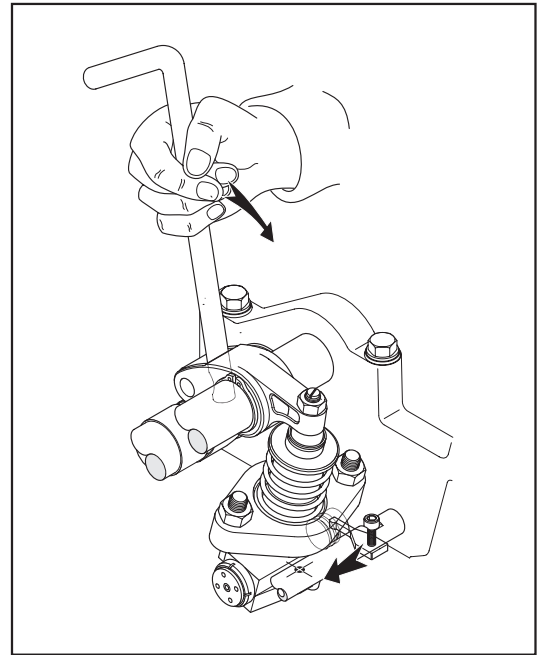
14.01 ill.3

- 4 Put unit injector withdrawing lever No. VR00126/0 onto rocker arm of individual unit injectors (ill. 4) and move upper end of lever in direction of air intake manifold. As a result, unit injector is pressed down and injection process is simulated.

NOTE: When moving the unit injectors, a creaky noise is to be heard during the injection process and/or a solid resistance is to be felt due to produced injection pressure (pressure point) .

If no difference is detectable in the individual unit injectors, continue with item 5.

- 5 Adjust control rack by means of special tool No. VR00148/0 to partial load (approx. 10-12 mm in direction full delivery) (ill.3) and remain in this position.
- 6 Repeat item 4.



14.01 ill.4

NOTE: Defective unit injectors which fail to produce a creaky noise in one or none of the two checks and/or where no resistance (pressure point) can be felt are to be exchanged. (Exchange unit injector, refer to 03.02.02).

- 7 Assembly is done in reverse order.

ATTENTION: Absolutely remove special tool No. VR 00148/0. Use new sealing ring.



Manual check of unit injector without tool No. VR 00148/0

Fuel System Check:

1. Investigate condition of return fuel. There should be neither air bubbles nor discoloration (gray) in the fuel.
2. Check proper flow quantity (i.e. engine at idle - flow rate after engine block 180 to 240 l/hr; 47 to 63 gal.)

Injector Check:

To feel the injection activities, move the control rack (quantity delivery) in between its acceptable travel (5 to 14mm) while depressing the „plunger“ with the rocker arm. For safe and easier handling, use our special tool lever.

While moving the rocker arm (and/or the plunger up and down), try to get the control rack into idle delivery position (approx. 4-5 mm). In this spot you will feel only a very slight/short pressure build up as the duration of injection is very short (~ 5mm³/stroke).

Keep this position on the control rack (freeze there) and then move over with tool VR 00126/0 to the next unit injector/rocker arm to repeat the plunge movement and feel the resistance during injection.

The test should give an equal pressure load/peak on each injector, while maintaining the same position on the control rack.

If one injector fails to show any pressure or this pressure peak is found in a much higher position of the control rack, this is an indication for a possible deficiency on this injector.

ATTENTION:



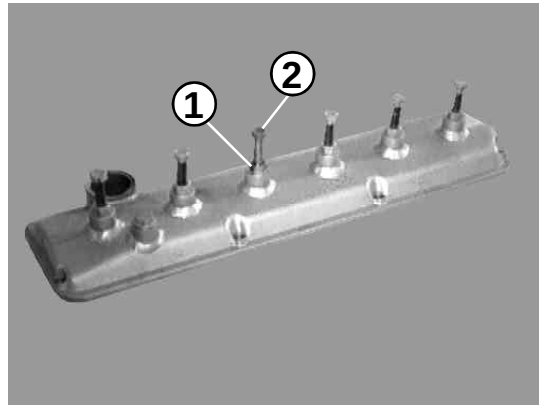
Before removing this unit injector from the engine, check for proper adjustment of the linking lever and for correct fit/tightness and/or torque of the unit injector mounting nuts.

03.14.02 Disengagement method of injection

NOTE: Disengagement method of injection is a simple and effective method to detect defective unit injectors with regard to formation of bubbles in both the fuel system and the engine cooling system or lack of power it related to deficiencies in injection equipment.

Preparation: Remove camshaft housing cover
refer 01.00.02

Special tool: 4 cyl. engines VR00133/1
6 cyl. engines with bossed seal surface
VR00133/0
6 cyl. engines with plane seal surface
VR00133/2



14.02 ill.1

1 ● Mount special tool No. VR00133/.(see list special tool) to disconnect injection.

2 Start the engine, let it run in idle and check if bubbles form.

NOTE: If there are no bubbles at idle speed of engine, continue with item 3.

3 Bring engine to operating temperature and then test the boat under operating conditions and watch for bubbles to form.
Keeping this operating condition, continue with item 4.

4 Loosen nut on cover (ill .1/pos.1), screw in, with fast turns, screw (ill.1/pos.2) until knocking noise disappears. Tighten nut (ill.1/pos.1) again. As a result, unit injector is pressed down to such an extent that injector cam can no more touch the rocker arm, thus preventing the injection of fuel. (respectively eliminating combustion)

5 Test the boat with disengaged unit injector under operating conditions and observe the returning fuel if bubbles still appear.

6 Continue to check all other injectors (cylinders) in order to detect the defective(s) unit injector(s).

NOTE: Bubble formation will change and/or stop as soon as injection of defective unit injector(s) is disengaged.

7 Replace defective unit injector(s).
(Replace unit injector, refer to 03.02.02)

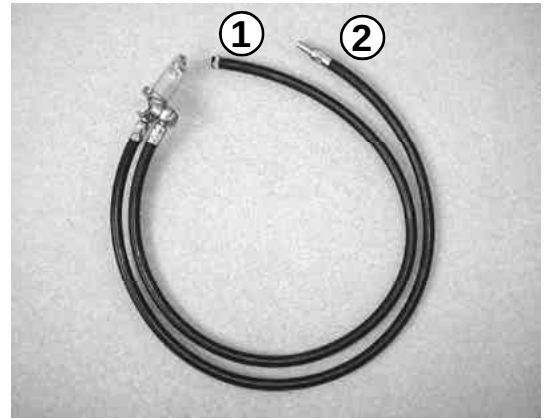
03.14.03 Air bubble formation in fuel system

Preparation: Change fuel filter, if necessary
refer to 03.09
(item 1, ventilate fuel system)

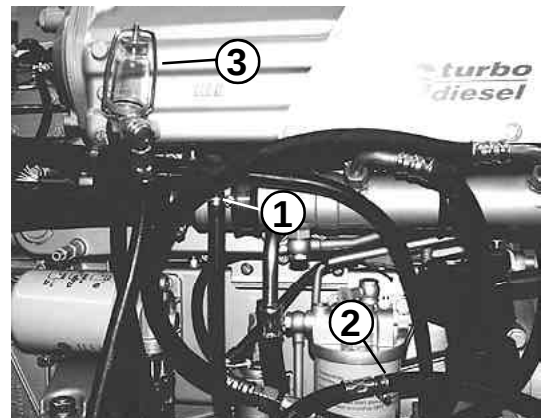
Special tool:

Testing device for fuel return 2300719/1

- 1 Disconnect hose from fuel return line on fuel cooler outlet to fuel tank. (ill.2/pos.1).
- 2 Connect hose (ill.1/pos.1) of testing device 2300719/1 to tandem cooler outlet. (ill.2/pos.1).
- 3 Connect hose (ill.2/pos.2) of testing device 2300719/1 with return hose to fuel tank. (ill.2/pos.2).
- 4 Hold testing device, glass bulb upwards (ill.2/pos.3), or fix it on the boat.



14.03 ill.1



14.03 ill.2

Procedure:

Check 1: Ventilate fuel system by 6 times ignition ON. Observe the sight glass as to complete ventilation of system (bubblefree fuel flow).

Result: If a bubblefree fuel flow cannot be achieved, search for the problem at the suction side (from fuel tank to fuel pump).

- Check:**
1. Fuel in tank.
 2. Tank suction pipe and fitting
 3. ANTI-SIPHON VALVE (if installed) leakage.
 4. Water separator leaky or contaminated.
 5. Check all fuel lines connections and fittings in the feed line (suction side) up to fuel pump intake.

After a bubblefree fuel flow can be achieved, continue with check 2.

Check2: Start the engine and let it run at idle speed. Observe the glass bulb.

Result: If bubble formation starts, search for the problem in the unit injectors. Probable contamination, on one or several nozzle elements cause a problem. Due to compression/combustion pressure, gases into the are forced fuel system through the unit nozzle(s).

- Check:** Defective unit injector(s) is/are to be detected definitely by means of "manual injection test methode"
(manual injection test methode, refer to 03.14.01)
- Manual:** If during disengagement methode of injection of unit injectors a creaky noise is to be heard and a solide resistance (pressure point) can be felt, check the tightening torque of the unit injectors (03.02.02 - assembly item 11).
Then repeat check 3.
- If a bubble formation appears during load operation, continue with check 3.
- Check 3:** Start the engine, bring it to operating temperature, test the boat under operating conditions and observe the glass bulb.
- Result:** If it comes to bubble formation, search for the problem in the area of unit injectors.
- Control:** Defective unit injector(s) is/are to be detected definitely by means of "Disengagement methode of injection"
(manual injection test methode, refer to 03.14.01)
- If there is still bubble formation, continue with check 4.
- Check 4:** Test the engine in the operating state where bubble formation occurs, by disengagement of injection per cylinder one after the other.
(Disengagement methode of injection, refer to 03.14.02).

Assembly is done in reverse order.